



Claims:

1. (Currently Amended) An earth boring bit adapted to be loaded with weight from a drill string during operation, comprising:

a body having at least one bit leg with a bearing pin depending therefrom;

a cone that is rotatably mounted on the bearing pin;

a seal in engagement with the bearing pin and the cone, the seal having an interior side exposed to lubricant within the cone and an exterior side adapted to be exposed to drilling fluid for sealing the lubricant from the drilling fluid; and

the cone having an annular surface on an exterior side of the seal separated from an annular surface of the bearing pin by a clearance into which drilling fluid is adapted to flow, the annular surface of the bearing pin being concentric with an axis of the bearing pin, the annular surface of the cone having at least one portion spaced closer to the annular surface of the bearing pin than at least one other portion when the bit is unloaded and when loaded, so that rotation of the cone when the bit is in operation causes a reduction at each point around the clearance as said at least one portion rotates around the bearing pin.

2. (Currently Amended) An earth boring bit, comprising:

a body having at least one bit leg with a bearing pin depending therefrom;

a cone that is rotatably mounted on the bearing pin;

a seal cavity between the bearing pin and the cone;

a seal within the seal cavity in engagement with the bearing pin and the cone; and

the seal cavity having a volume that differs when measured at one circumferential point than other circumferential points when the bit is unloaded and when loaded; and

wherein the volume of the seal cavity measured at any selected point around the circumference of the bearing pin changes at least once per revolution of the cone when the bit is in operation.

3. (Previously Presented) The bit according to claim 2, wherein a radial width of the seal cavity measured at any selected point around the circumference of the bearing pin changes at least once per revolution of the cone.

4. (Previously Presented) The bit according to claim 2, wherein the seal cavity has a mouth that is circular and has an axis that is offset from the axis of the bearing pin.

5. (Previously Presented) The bit according to claim 2, wherein a radial width of the seal cavity increases gradually from a minimum width point to a maximum width point 180 degrees from the minimum width point.

6. (Previously Presented) The bit according to claim 2, wherein an annular clearance is located between the seal cavity and an outer diameter of the seal, the annular clearance varying in radial width around the outer diameter of the seal.

7. (Previously Presented) The bit according to claim 2, wherein the seal comprises:

a metal seal ring;

an elastomeric energizer ring that in stationary contact with the bearing pin and urging the metal seal ring into contact with a seal face that rotates with the cone; and wherein

an annular space is located between an outer diameter of the metal seal ring and the seal cavity, the annular space having a radial width that varies around the outer diameter of the metal seal ring.

8. (Previously Presented) The bit according to claim 2, wherein the seal comprises:

a metal seal ring;

an elastomeric energizer ring that in stationary contact with the bearing pin and urging the metal seal ring into contact with a seal face that rotates with the cone; and wherein

the seal cavity has a greater inner diameter than an outer diameter of the metal seal ring and an axis offset from an axis of the metal seal ring.

9. (Previously Presented) The bit according to claim 2, wherein the seal comprises an elastomeric ring, and wherein the seal cavity has a groove that is located outward of the ring, the groove being spaced radially from a seal boss formed on the bit leg, the groove being eccentric relative to an axis of the bearing pin.

10. (Canceled)

11. (Currently Amended) An earth boring bit that is adapted to be loaded with weight from a drill string during operation, comprising:

a body having at least one bit leg with a bearing pin depending therefrom;

a cone having a cavity for rotatably mounting the cone on the bearing pin;

an entrance portion of the cavity extending around an outer diameter portion of the bearing pin, defining an annular seal cavity that has a radial width that varies so that as the cone rotates when the bit is unloaded and when loaded, the width of the seal cavity at any point along the outer diameter portion of the bearing pin changes at least once per revolution of the cone; and

a seal in the seal cavity for sealing between the cone and the bearing pin

12. (Original) The bit according to claim 11, wherein the radial width of the annular clearance increases gradually from a minimum point to a maximum point 180 degrees from the minimum point.

13. (Original) The bit according to claim 11, wherein the entrance portion of the cavity is circular and has an axis that is offset from an axis of rotation of the cone.

14. (Original) The bit according to claim 11, wherein the width of the seal cavity changes once per revolution at any point along the outer diameter portion of the bearing pin.

15. (Original) The bit according to claim 11, wherein the seal comprises:

a metal seal ring; and

an elastomeric energizer ring that is in stationary contact with the bearing pin and urges the metal seal ring into contact with a seal face that rotates with the cone.

16. (Withdrawn) The bit according to claim 11, wherein:

the seal comprises an elastomeric ring;

the outer diameter portion of the bearing pin comprises a seal boss located outward from the ring; and

an eccentric groove is formed at the entrance portion of the cavity.

17 . (Currently Amended) An earth boring bit that is adapted to be loaded from weight of a drill string during operation, comprising:

a body having at least one bit leg with a bearing pin depending downward and inward therefrom;

a cone having a cavity that concentrically receives the bearing pin for rotation about an axis of the bearing pin, the cavity having a seal face located therein and a mouth at an entrance portion of the cavity;

a seal assembly in stationary engagement with the bearing pin and sliding engagement with the seal face in the cavity of the cone; and

the mouth of the cavity being circular about an axis that is offset from the axis of the bearing pin while the bit is unloaded and when loaded, so that the mouth of the cavity rotates eccentrically relative to the bearing pin during operation of the bit.

18. (Original) The bit according to claim 17, wherein the mouth of the cavity is spaced radially from the seal assembly.

19. (Original) The bit according to claim 17, wherein the seal assembly comprises:

a metal seal ring; and

an elastomeric energizer ring that is in stationary contact with the bearing pin and urges the metal seal ring into contact the seal face; and wherein

the mouth is radially spaced from an outer diameter of the metal seal ring by an annular clearance.

20.-21. (Canceled)

22. (Previously Presented) The bit according to claim 1, wherein:

the annular surface of the cone is eccentric relative to the axis of the bearing pin.

23. (Previously Presented) The bit according to claim 1, wherein:

the annular surface of the bearing pin is a cylindrical surface of a seal boss that is coaxial with the axis of the bearing pin; and

the annular surface of the cone is spaced radially from the cylindrical surface of the seal boss and is eccentric relative to the axis of the bearing pin.

24. (Withdrawn) The bit according to claim 1, wherein:

the annular surface of the bearing pin comprises a machined surface extending around the bearing pin at a junction of the bearing pin with the bit leg;

the annular surface of the cone comprises a backface of the cone; and

said at least one portion comprises at least one vane protruding from the backface.